

# Chapter 10

## Precision Irrigation for Sustainable Agricultural Productivity

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### ABSTRACT

*Precision irrigation is a water management strategy that applies water to crops based on their specific needs. It is a sustainable practice that can help to increase crop yields, reduce water use, improve fertilizer use efficiency, and reduce environmental impact. This chapter offers a detailed overview of precision irrigation for sustainable agricultural productivity. It defines precision irrigation and discusses its benefits, types, components, design, implementation, management, applications, and economic and environmental benefits. The chapter also discusses the role of precision irrigation in sustainable agriculture, challenges and opportunities for adoption, and the future of precision irrigation. It is intended to be a valuable resource for farmers, researchers, policymakers, and other stakeholders interested in learning more about precision irrigation's role in sustainable agriculture.*

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## 1. INTRODUCTION TO PRECISION IRRIGATION

### 1.1. What Is Precision Irrigation?

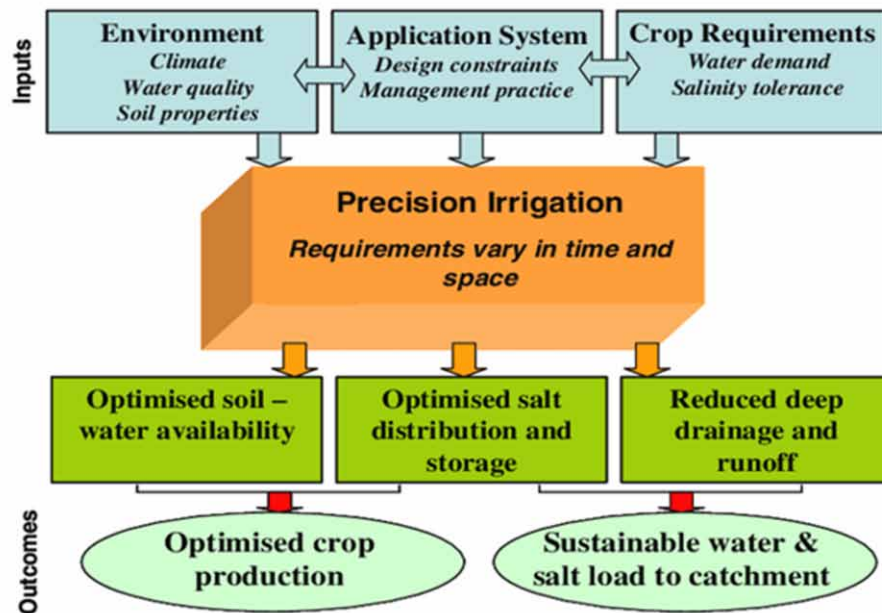
Precision irrigation is an advanced water management strategy that involves carefully distributing water resources to crops according to their individual needs (Abioye, *et al.*, 2020). This advanced and meticulously calibrated irrigation system represents a departure from traditional irrigation techniques like flood irrigation. Instead, it relies on a wealth of data to optimize the irrigation process, enhancing its overall efficiency and sustainability. This technique transcends traditional methods of irrigation by employing cutting-edge technology and data-driven approaches to optimize water usage.

The primary focus of precision irrigation is to deliver the right amount of water, at the right time, and in the right place to maximize crop productivity while minimizing water wastage and environmental impacts (Zhang, *et al.*, 2021). Figure 1 illustrates the implementation of precision irrigation techniques in contemporary agriculture, showcasing efficient water management for optimized crop growth and resource utilization. This rigorous method makes it possible to apply water precisely, ensuring that crops receive the ideal level of moisture needed for the best possible growth and development.

### 1.2. Benefits of Precision Irrigation for Sustainable Agricultural Productivity

- Precision irrigation is an essential practice in contemporary agriculture owing to its manifold advantages, encompassing economic, environmental, and agronomic dimensions. The system enhances water efficiency by precisely delivering an appropriate quantity of water directly to the root

Figure 1. Precision irrigation



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